PRICE®

2021 NASA Cost & Schedule Symposium

Lessons Learned From Advance Air Mobility Systems

Estimate with Confidence™

Today's Presenters

William Gbelee

Solutions Consultant

William serves as a technical resource for the Government sector, providing training, mentoring, and consulting in predictive estimation and data analysis. Prior to joining PRICE®, he spent 4+ years supporting DoD cost estimating, Budgeting, and Air Force Life Cycle Management Center (AFLCMC). William holds a B.S. in Accounting & Finance from Wright State University.

Vincent Delisle

Solutions Consultant

Vince supports the Commercial sector as a consultant, mentor, and trainer for A&D corporations. Vince brings 5 years of experience as a Material and Labor Cost Estimator at Sikorsky, A Lockheed Martin Company to the team. Vince holds a bachelor's from the School of Business at the University of Connecticut where he studied Finance.

Agenda

- AAM/UAM Market Overview

- The need for Cost Analytics

- Recent eVTOL Work

- Lessons Learned
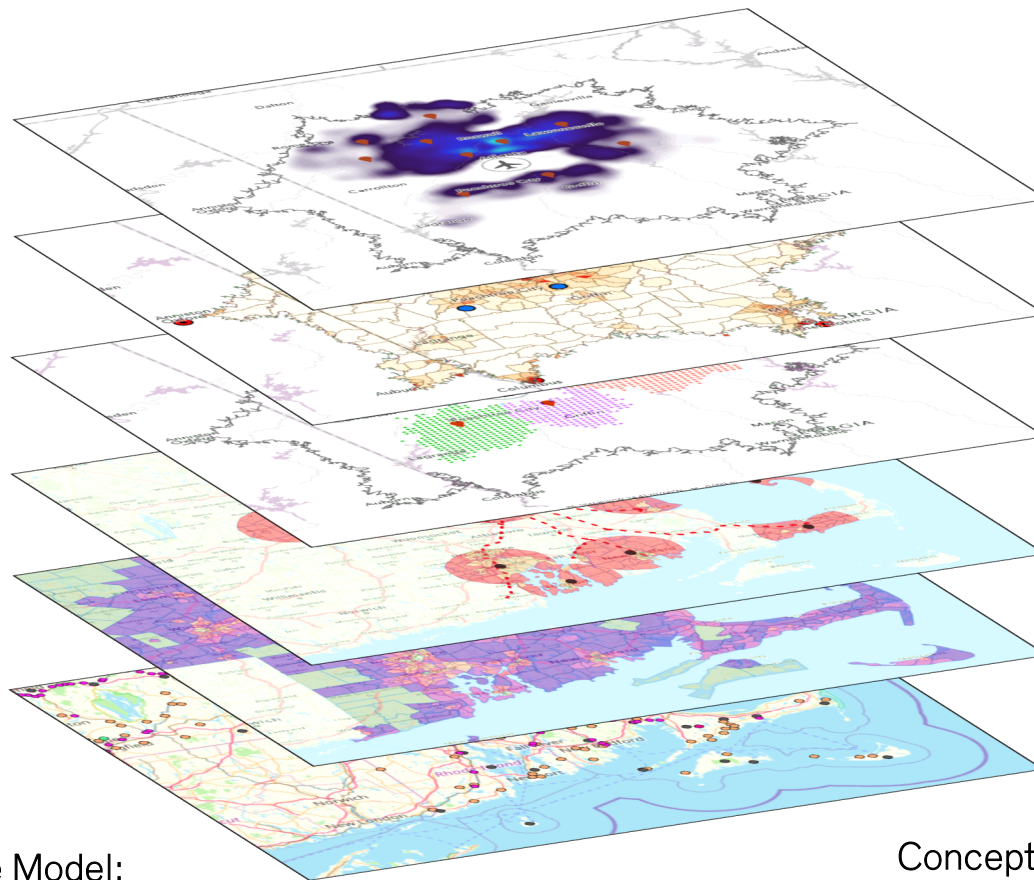
- Q&A

Fulfilling Market Opportunities in UAM/AAM
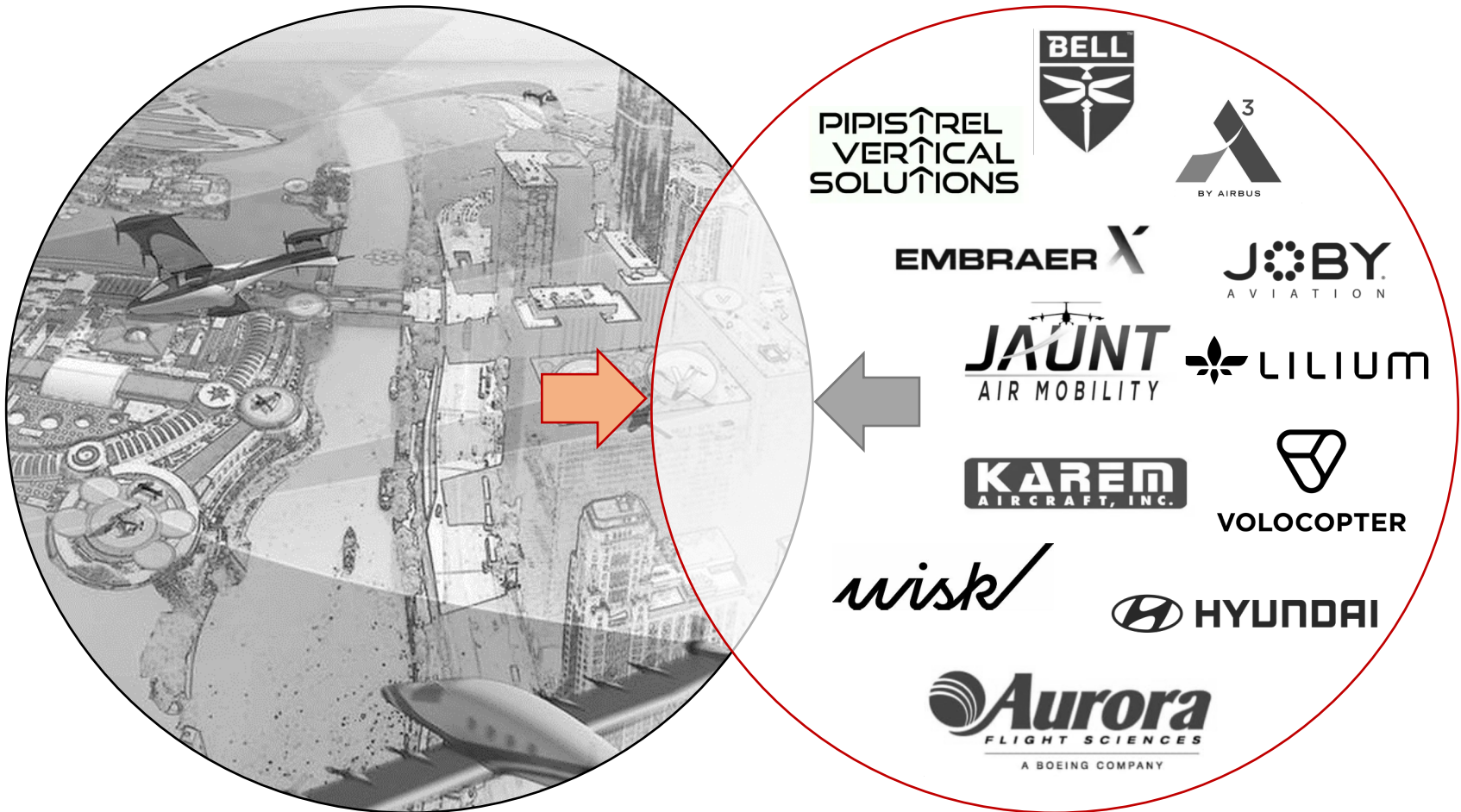
Artist's impression of the urban airspace. Image courtesy NASA/Advanced Concepts Laboratory

AAM Feasibility & Economic Viability
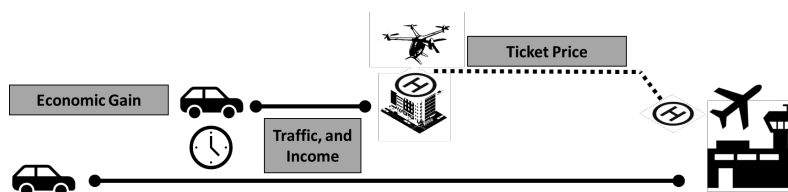

Geomatics/GIS:

- ❑ Ridership Demand
- ❑ Travel pattern
- ❑ Congestion
- ❑ Service catchment
- ❑ Aviation infrastructure
- ❑ Demographics
- ❑ Mass transit locations
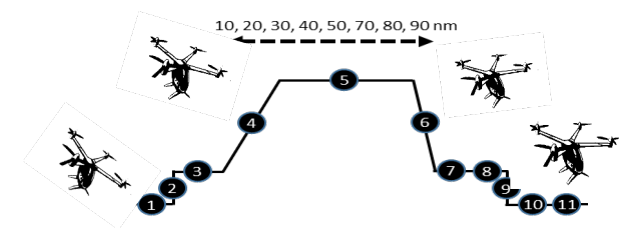- ❑ Airspace routing
- ❑ Weather
- ❑ MRO
- ❑ Etc.

Scenarios:

- o On-demand air taxi
- o Chartered flight
- o Airport shuttle
- o Cargo service
- o Tourism and entertainment
- o Fire/police/search rescue
- o Etc.

Choice Model:

Economic Gain

Ticket Price

Traffic, and Income

Concept of Operations:

10, 20, 30, 40, 50, 70, 80, 90 nm

1 2 3 4 5 6 7 8 9 10 11

AAM community lacks cost analytic rigor and economic analysis framework for engineers.

Recent eVTOL Work

Case Study #1: eVTOL Cargo Air Vehicle

- ## Air Vehicle "Should Cost"

  - *Performed to level 5 WBS*

- ## Effectively and accurately model advance manufacturing for:

  - *Propulsion (Batteries, Motors, Rotors, Motor Controllers, Wiring)*

  - *Structures (Metals, Composites)*

  - *Avionics*

  - *Assembly*

Source: https://assets.evtol.com/wp-content/uploads/2020/04/Boeing-Cargo-Air-Vehicle.jpg

Lessons Learned

- ## Things to account for

    - ❑ *Propulsion; Batteries*
    - ❑ *Composites*

- ## How to execute

    - ☑ *Leveraged PRICE Research on battery propulsion*
    - ☑ *PRICE Composite Complexity calculator*

Case Study #2: Hyundai Air Taxis

- Cost Comparison of 3 conceptual designs with different levels of complexity and performance

- Costs of all phases
  - *Development,*
  - *Production*
  - *O&S*

Source:
https://www.uavexpertnews.com/wp-content/uploads/2020/01/Large-39871-UberandHyundaiMotorAnnounceAerialRidesharingPartnershipReleaseNewFull-ScaleAirTaxiModelatCES-1536x864.jpg
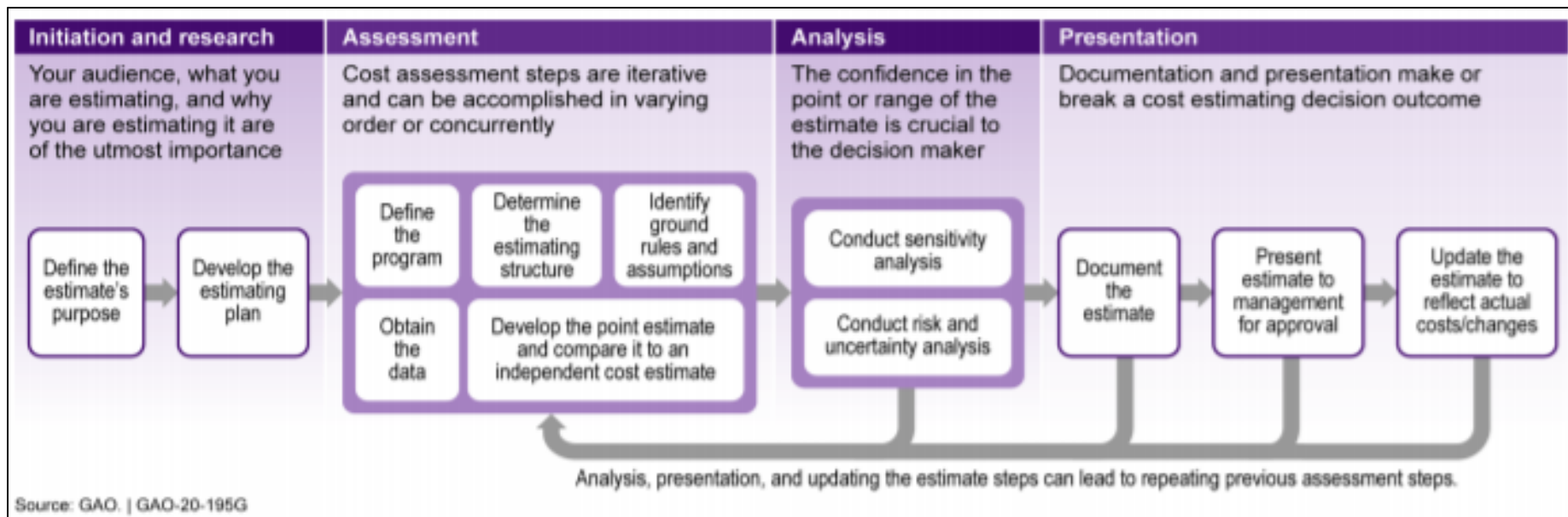
Lessons Learned

- ## Things to account for

  - ❑ *Estimating multiple concepts*

  - ❑ *Establish product breakdown structure (PBS)*

  - ❑ *High level of automation of manufacturing process*

- ## How to execute

  - ☑ *Generate initial surveys to address uniqueness of each concept, conduct SME interviews*

  - ☑ *Gather weights and weight allocation*

  - ☑ *Make reasonable adjustment to Labor and Material Learning Curve*

Takeaway

- Trust the process

- Develop the estimating plan
  - Determine scope, data availability, purpose, and timeframe
  - Write the plan down

Questions?

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